WHAT IS CLAIMED IS:

1. A micromechanical resonator device having a desired mode shape, the device comprising:

a substrate;

a resonator having a stationary surface area wherein the desired mode shape is characterized by a plurality of peripheral nodal points located about a periphery of the resonator and wherein the desired mode shape involves movement of only a fraction of the stationary surface area at resonance; and

a non-intrusive support structure anchored to the substrate to support the resonator above the substrate and attached to the resonator at at least one of the peripheral nodal points to reduce mechanical losses to the substrate.

2. The device as claimed in claim 1, further comprising a drive electrode structure adjacent the resonator for driving the resonator so that the resonator changes shape at resonance.

3. The device as claimed in claim 1, wherein the resonator is an extensional mode device having a compound mode that involves both radial and tangential displacement.

4. The device as claimed in claim 3, wherein the resonator is a disk resonator.

5. The device as claimed in claim 3, wherein the resonator is a ring resonator.

6. The device as claimed in claim 4, wherein the disk resonator is a solid disk resonator.

7. The device as claimed in claim 1, wherein the non-invasive support structure forces the resonator to vibrate in the desired mode shape while suppressing any undesired mode shapes.

8. The device as claimed in claim 1, wherein the desired mode shape is a compound mode shape such as a wine-glass mode shape or a triangular mode shape.

9. The device as claimed in claim 1, further comprising a drive electrode structure formed on the substrate at a position to allow electrostatic excitation of the resonator so that the resonator is driven in the desired mode shape and wherein the resonator and the drive electrode structure define a capacitive gap therebetween.

10. The device as claimed in claim 9, wherein the drive electrode structure is disposed about the periphery of the resonator.

11. The device as claimed in claim 9, wherein the capacitive gap is a sub-micron, lateral, capacitive gap.

12. The device as claimed in claim 9, wherein the drive electrode structure includes a plurality of split electrodes.

13. The device as claimed in claim 1, wherein the desired mode shape is further characterized by a central nodal point which corresponds to a center of the resonator and wherein the central nodal point and a pair of the peripheral nodal points are disposed on a nodal axis having substantially no radial displacement at resonance.

14. The device as claimed in claim 1, wherein the support structure includes a plurality of anchors positioned about the periphery of the resonator.

15. The device as claimed in claim 9, further comprising a sense electrode structure formed on the substrate at a position to sense output current based on motion of the resonator.

16. The device as claimed in claim 15, wherein the drive electrode structure includes a plurality of separate input drive electrodes and the sense electrode structure includes a plurality of separate output sense electrodes.

17. The device as claimed in claim 1, wherein the device is diamond-based, silicon carbide-based or a composite material having high acoustic velocity.

18. The device as claimed in claim 1, wherein the device is silicon-based or a composite material having high acoustic velocity.

19. The device as claimed in claim 1, wherein the desired mode shape is a triangular disk mode shape.

20. The device as claimed in claim 1, wherein the desired mode shape is a wine-glass ring mode shape.

21. A method of making a micromechanical device, the device including a first structure and a non-intrusive support structure attached to the first structure at at least one anchoring point, the method comprising:

providing a substrate;

forming the first structure on the substrate; and

forming the non-invasive support structure anchored to the substrate to support the first structure above the substrate wherein the at least one anchoring point is defined substantially simultaneously with formation of the first structure to insure that the at least one anchoring point is precisely located relative to the first structure.

22. A method of making a micromechanical resonator device having a desired mode shape, the device including a resonator and a non-intrusive support structure attached to the resonator at at least one anchoring point wherein

the desired mode shape is characterized by a plurality of peripheral nodal points located about a periphery of the resonator, the method comprising:

providing a substrate;

forming the resonator on the substrate; and

forming the non-invasive support structure anchored to the substrate to support the resonator above the substrate wherein the at least one anchoring point is defined substantially simultaneously with formation of the resonator to insure that the at least one anchoring point is precisely located at one of the peripheral nodal points.

23. The device as claimed in claim 9, wherein the resonator is a ring resonator having inner and outer peripheries and wherein the drive electrode structure includes inner and outer sets of electrodes disposed about the inner and outer peripheries, respectively.